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Vestnik Akademii Nauk SSSR, No 6, 1950, pp 122-123.

AN EFFECTIVE METHOD FOR DETERMINING THE ELEMENTS OF ATMOSPHERIC RADIATION EXCHANGE

In the Geographical Institute, Academy of Sciences USSR, L. V. Gul'nitskiy defended his dissertation for the degree of Doctor of Physicomathematical Sciences, on an effective method of determining the elements of atmospheric radiation exchange. The existing methods of radiation calculation, which are necessary for weather forecasting, and the present equipment at actinometric stations do not satisfy the requirements. The sensitivity of the instruments varies with the meteorological elements and these variations are sometimes difficult to check; thus the voluminous data obtained by actinometric stations cannot be used.

In his dissertation, Gul'nitskiy analyzed present-day actinometric equipment and formulated improved methods for studying radiation exchange. He designed a number of instruments, the main one being the pyrheliometer-pyrgeometer, which makes the pyrgeometric scale absolute and has universal application (i.e., it can be used for measuring both direct solar radiation and effective radiation). The new instrument permits one to obtain directly in absolute units, the earth's effective radiation and its constants. With the help of this instrument, the pyrgeometric scale can be related to the pyrheliometric. The receiving element in this pyrheliometer-pyrgeometer is an Albrecht pyranometer improved by Gul'nitskiy so that it is freed from the effect of prolonged action of the meteorological factors and is capable of reacting to radiation effects in both the bright and dark parts of the day.

The operating principle of this instrument is given by the author, and moreover all derivations are reduced to figures and compiled in tables, graphs, and nomograms. The introduction of this instrument into practice, in the opinion of official opponent A. I. Kaygorodov, Poctor of Physicomathematical Sciences, will prove very important for actinometric observations.

Gul'nitskiy also designed instruments for the determination of total radiation energy, for direct determination of the radiation balance of a blackbody and for the measurement and recording of ultraviolet radiation by the thermal method (an ultraviolet compensation actinometer, an ultraviolet actinograph, and a pyrheliometer for variable thermal conditions). He also constructed a small model of the pyrheliometer-pyrgeometer for use in expeditions. These instruments make possible actinometric observations on elements difficult

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to measure, such as short-wave ultraviolet radiation. They also create important methodological refinements such as integration and registration of all forms of radiation, i.e., total and ultraviolet radiation balance, black-body radiation, and effective radiation of the earth.

From prolonged observations t Minsk and Alma-Ata, Gul'nitskiy refuted existing data on a very important problem for the weather service, namely, the problem of the seasonal behavior of effective radiation. He proved convincingly that the Angstrom pyrgeometer used for observations of this effect inanges its sensitivity under the influence of seasonal humidity variations, and that this is the reason for the incorrect conclusions. He also substantially revised data on the diurnal behavior of effective radiation. Important results were obtained from his observations on the radiation characteristics of air masses and from his determination of the solar constant and the boundary transparency coefficient. Gul'nitskiy suggested a method for determining the solar constant which permits use of the vast material obtained at actinometric stations (mainly total direct solar radiation measured for different are masses).

In the opinion of official opponent V. G. Fesenkov, the method proposed can easily be brought up to the required degree of accuracy and its development will permit organization of important studies on the radiation balance at various heights over the earth's surface. These studies should produce valuable materials for clarifying the energy regime of our planet.

Official opponent I. A. Khvostikov, Doctor of Physicomatematical Sciences, noted the great theoretical interest and practical importance of the dissertation for the climatological service.

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